

REMARKS

Claims 1-10 are pending in the application. Claim 10 has been amended, herein.

Claim Amendments

Applicants have amended claim 10 to reflect the depositing of materials as an active step. Support for this amendment can be found at least in paragraph [0037] of the printed publication of the present application.

Examiner Request for Information

Under the heading "Information Disclosure Statement," the Examiner has requested that Applicants provide seven references that the Examiner considers material and relevant to patentability. Accordingly, Applicants have submitted herewith an Information Disclosure Statement with a copy of the requested references.

Rejection of claims 1-10 under 35 USC § 102(e)

Claims 1-10 remain rejected under 35 USC § 102(e) as allegedly anticipated by Boland et al. (U.S. Pat. No. 7,051,654; hereinafter "Boland").

Previously, the Examiner asserted that the Declarations of Inventor Wei Sun under 37 C.F.R. § 1.131 dated August 26, 2009 and March 25, 2010 were not persuasive, presumably because they did not establish a "date of invention" of February 22, 2003, but instead only established that the Applicants provided a drawing of a multi-nozzle printer to Mironov as of February 22, 2003.

Applicants then filed a Declaration of Inventor Wei Sun under 37 C.F.R. § 1.131 dated November 10, 2010, to which the Examiner now asserts is ineffective, because there is no nexus between the two teachings (Exhibits A and B of the November 10, 2010 Declaration) either from the two Exhibits themselves, or from the Declarant's statement.

Applicants respectfully submit that Boland does not anticipate claims 1-10 of invention for the following reasons. 35 U.S.C. § 102(e) provides that an applicant shall be entitled to a patent unless "the invention was described in ... a patent granted on an application

for patent by another filed in the United States before the invention by the applicant for patent" Boland does not satisfy this requirement.

In view of the enclosed Declaration of Inventor Wei Sun under 37 C.F.R. § 1.131 (executed July 19, 2011), Boland does not anticipate claims 1-10, because inventor Wei Sun, the sole inventor of the subject matter of claims 1 and 10, invented the subject matter of claims 1 and 10 prior to February 22, 2003, which is before the earliest date to which Boland might qualify as a prior art reference. Claims 2-9 are likewise not anticipated by Boland, by virtue of the fact that they ultimately depend from patentably distinct claim 1.

The present application, U.S. App. Ser. No. 10/540,968, is a national stage entry application of PCT/US04/15316, filed May 14, 2004, which claims priority from U.S. Provisional App. No. 60/520,272, filed November 14, 2003. Boland was filed on September 17, 2003, published on December 2, 2004, issued as a patent on May 5, 2006, and claims priority to U.S. Provisional App. No. 60/747,469 which was filed on May 30, 2003.

Boland is not a proper 35 U.S.C. §102(e) reference because Applicant Wei Sun of the present application invented the apparatus of claim 10, as well as the process of at least claim 1 that the apparatus performs, before Boland, as evidenced by the apparatus and the processes performed as described and depicted in Exhibits A and B, prior to February 22, 2003, which is earlier than the earliest date that Boland could conceivably qualify as a prior art reference.

The unpublished manuscript of Exhibit A describes the process for construction of heterogeneous CAD modeling based composite unit cells. As explained in the unpublished manuscript of Exhibit A, the constructed unit cell is a multi-volume based CAD model with material heterogeneity assigned as a design attribute in the volume. Modified Boolean operation with reasoning merging and extracting is developed to execute the object manipulation between different materials (volumes). The heterogeneous unit cell model is capable of capturing the designed geometrical configuration and reinforcement orientation at the individual constituent phases, as well as retaining the distinctive reinforcement and matrix material properties. In addition, the developed unit cell model is also intended for implementation with available CAD/CAE/CAM systems for integrated design, simulation, and manufacturing of advanced composites. The unpublished depictions of Exhibit B illustrate various designs of a multi-nozzle biopolymer deposition apparatus for implementing the processes described in the unpublished manuscript of Exhibit A. The depicted apparatus of Exhibit B is a multi-nozzle printer designed

to process the desired scaffold model and convert it into a layered process tool path, as well as to simultaneously deposit materials to construct the scaffold.

With regard to the Examiner's concern that there is no nexus between the two teachings either from the two Exhibits themselves or from the Declarant's statement, Applicants' stress with earnest that such a nexus is provided, and can be found at least in numbered paragraph 10 of Declarant's statement of July 19, 2011. As explained by the Declarant, the depictions of Exhibit B illustrate various designs of a multi-nozzle biopolymer deposition apparatus for implementing the processes described in the unpublished manuscript of Exhibit A. The Declarant further states that the apparatuses as depicted in Exhibit B are embodiments of the machinery for carrying out the process steps described in Exhibit A. These statements by the Declarant directly link the teachings of the two Exhibits, and therefore provide a nexus between them.

Even assuming, *arguendo*, that the filing date of U.S. Provisional App. No. 60/747,469 is available as the critical date of Boland under §102(e), that filing date occurs after February 22, 2003 and thus Boland cannot anticipate the claims of the present application under §102(e).

In light of the present arguments, Applicants respectfully request reconsideration and withdrawal of the rejection of claims 1-10 under 35 U.S.C. § 102(e).

Rejection of claims 1-10 under 35 USC § 103(a)

Claims 1-10 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Hu et al. in view of Sun et al. (Computer Methods and Programs in Biomedicine 67 (2002) 85-103), and Applicant's statements in the affidavit of 11/10/2010. Specifically, the Examiner asserts that Hu discloses the same teaching of the unpublished manuscript, and although Hu does not disclose the multi-nozzle printer, Sun discloses that multi-nozzle in jet printers are commonly used in rapid prototyping processes.

According to the U.S. Supreme Court ruling in *Graham v. John Deere*, 383 U.S. 1, 148 USPQ 459 (1966), in making a *prima facie* case for obviousness, the Examiner must 1) determine the scope and content of the prior art; 2) ascertain the differences between the prior art and the claims at issue; 3) resolve the level of ordinary skill in the pertinent art; and 4) evaluate

evidence of secondary considerations. These principles have been reconfirmed by the Supreme Court in *KSR International Co. v. Teleflex Inc.*, 127 S.Ct. 1727 (2007).

To establish a *prima facie* case of obviousness, all the claim limitations must be taught or suggested by the prior art. See *In re Royka*, 490 F.2d 981, 985, 180 USPQ 580 (CCPA 1974). In determining the differences between the prior art and the claims under the Graham analysis, the invention as a whole must be considered (MPEP 2141.02; citing *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983); *Schenck v. Nortron Corp.*, 713 F.2d 782, 218 USPQ 698 (Fed. Cir. 1983)). Furthermore, objective evidence relevant to the issue of obviousness must be evaluated by Office personnel. See *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966). "Secondary considerations" may include evidence of commercial success, long-felt but unsolved needs, failure of others, and unexpected results.

It appears that the Examiner has misconstrued the disclosure of Sun, particularly with regard to Sun purported teaching that "multi-nozzle in jet printers are commonly used in rapid prototyping processes." As quoted by the Examiner, Sun recites:

Three-dimensional printing (3-DP), creates models by spraying liquid binder through ink-jet printer nozzles on to a layer of metallic or ceramic precursor powder.

This simply does not suggest multi-nozzle printing, particularly multi-nozzle printing of a heterogeneous material part or device, as recited in the claims. Applicants note that Sun mentions only the spraying of a single material (the binder), and not multiple materials in the creation of a heterogeneous material part or device. Furthermore, the use of "nozzles" in a grammatically plural form can also mean replacing the nozzle of a single nozzle assembly during the course of printing. Simply put, Sun's use of the term "nozzles" does not impress into the mind of one skilled in the art a "multi-nozzle assembly" designed for the creation of a heterogeneous material part or device.

Additionally, Applicants note that claim 1 recites that the multiple nozzles are different and specialized. There is absolutely no mention of different and/or specialized, multiple nozzles in either of the disclosures of Hu or Sun. To the extent the Examiner continues to read the disclosure of Sun as describing a multi-nozzle assembly, Applicants stress that

because Sun only describes the spraying of a single material (the binder), there would be no good reason or motivation to have different and/or specialized nozzles in the assembly.

Likewise, claim 10 recites that the material delivery system comprises multiple nozzles of different types and sizes, and further recites that the delivery system simultaneously deposits specified hydrogels with different viscosities to construct a scaffold from the designed scaffold model. Again, there is absolutely no mention of multiple nozzles of different types or sizes in either of the disclosures of Hu or Sun. Furthermore, neither Hu nor Sun make any mention of a multi-nozzle system that deposits two different types of hydrogels, where the various hydrogels have different viscosities. Again, Sun only describes the spraying of a single material (the binder), not the depositing of two or more different materials, as claimed, because Sun was not describing a multi-nozzle system. Therefore, Sun cannot cure the deficiencies of Hu.

In view of the above, Applicants submit that a *prima facie* case of obviousness has not been established and respectfully request reconsideration and withdrawal of the rejections of claims 1-10 under 35 U.S.C. §103(a).

Summary

Applicants respectfully submit that the arguments set forth herein evidence that the pending claims are in full condition for allowance. Accordingly, favorable examination of the claims is respectfully requested at the earliest possible time.

Respectfully submitted,

WEI SUN, ET AL.

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